What is claimed is:

1. An olefin isomerization process which comprises contacting a fluid feed stream containing an olefin with an activated basic metal oxide catalyst under olefin isomerization conditions, the activated catalyst having an initial activity for olefin isomerization and containing an amount of activity-affecting impurity which does not exceed that amount which will result in a reduction of the initial catalyst activity by about 0.075 percent conversion loss per hour as measured by the isomerization of 1-butene to 2-butene.

2. The olefin isomerization process of claim 1 wherein the basic metal oxide catalyst is selected from the group consisting of magnesium oxide, calcium oxide, barium oxide, lithium oxide and combinations thereof.

3. The olefin isomerization process of claim 1 wherein the catalyst is magnesium oxide.

4. The olefin isomerization process of claim 1 wherein the activity-affecting impurity in the basic metal oxide catalyst is, or contains, sulfur, phosphorus, at least one transition metal or a combination thereof.

5. The olefin isomerization process of claim 4 wherein the at least one transition metal is iron, chromium, cobalt, nickel, or a combination thereof.

6. The olefin isomerization process of claim 1 wherein the catalyst contains no more than about 2000 ppm of sulfur and/or phosphorous and no more than about 500 ppm of one or more transition metals.

7. The olefin isomerization process of claim 1 wherein the catalyst contains no more than about 1000 ppm of sulfur and/or phosphorous and no more than about 400 ppm of one or more transition metals.

8. The olefin isomerization process of claim 1 wherein the catalyst contains no more than about 75 ppm of sulfur and/or phosphorous and no more than about 330 ppm of one or more transition metals.

9. The olefin isomerization process of claim 1 wherein the fluid feed stream comprises an olefin possessing an internal double bond, at least some of the olefin possessing an internal double bound being converted to a corresponding terminal olefin.

10. The olefin isomerization process of claim 9 wherein the olefin possessing an internal bond comprises 2-hexene and/or 3-hexene and the corresponding terminal olefin is 1-hexene.

11. The olefin isomerization process of claim 9 wherein the olefin possessing an internal double bond is 2-butene and the corresponding terminal olefin is 1-butene.

12. The olefin isomerization process of claim 10 wherein the conversion of 2-butene to 1-butene is from about 20 percent to about 30 percent.

13. The olefin isomerization process of claim 1 wherein the olefin isomerization conditions include a temperature of at least about 300°C.

14. The olefin isomerization process of claim 1 wherein the olefin isomerization conditions include a temperature of from about 340°C to about 500°C.

15. The olefin isomerization process of claim 1 wherein the basic metal oxide catalyst is selected from the group consisting of magnesium oxide, calcium oxide, barium oxide, lithium oxide and combinations thereof, and the activity-

affecting impurity includes sulfur, phosphorus, at least one transition metal or a combination thereof.

16. The olefin isomerization process of claim 15 wherein the at least one transition metal is iron, chromium, cobalt, nickel, or a combination thereof.

17. The olefin isomerization process of claim 3 wherein the catalyst contains no more than about 2000 ppm of sulfur and/or phosphorous and no more than about 500 ppm of one or more transition metals.

18. The olefin isomerization process of claim 3 wherein the catalyst contains no more than about 1000 ppm of sulfur and/or phosphorous and no more than about 400 ppm of one or more transition metals.

19. The olefin isomerization process of claim 3 wherein the catalyst contains no more than about 75 ppm of sulfur and/or phosphorous and no more than about 330 ppm of one or more transition metals.

20. A process for isomerizing C_4 olefin derived from a mixed C_4 stream comprising the steps of:

a) providing a C_4 stream containing butadiene, 1-butene, 2-butene, and isobutylene;

b) selectively hydrogenating the C_4 stream in the presence of a hydrogenation catalyst and hydrogen whereby the butadiene is selectively hydrogenated;

c) simultaneously hydroisomerizing and fractionating the feed to convert 1-butene to 2-butene and to remove the isobutylene by fractionation; and

d) contacting the C_4 stream with an activated basic metal oxide catalyst under olefin isomerization conditions, the activated catalyst having an initial activity for olefin isomerization and containing an amount of activity-affecting impurity which does not exceed that amount which will result in a reduction of the initial catalyst activity by about 0.075 percent conversion loss per hour.

21. The process of claim 20 wherein the basic metal oxide catalyst contains no more than about 2000 ppm of sulfur and/or phosphorous and no more than about 500 ppm of one or more transition metals.

22. The process of claim 20 wherein the basic metal oxide catalyst contains no more than about 1000 ppm of sulfur and/or phosphorous and no more than about 400 ppm of one or more transition metals.

23. The process of claim 20 wherein the basic metal oxide catalyst contains no more than about 75 ppm of sulfur and/or

phosphorous and no more than about 330 ppm of one or more transition metals.